

BOTANICAL MUSEUM LEAFLETS

HARVARD UNIVERSITY

AMBRIDGE, MASSACHUSETTS, MAY 27, 1943

VOL. 11, No. 3

STUDIES IN HABENARIA AND DICHAEA

BY

OAKES AMES AND DONOVAN S. CORRELL

I. THE PROBLEM OF HABENARIA FLAVA

HABENARIA, the largest genus of native orchids in the United States and Canada, presents some complex and extremely difficult taxonomic and nomenclatorial problems. This is especially true of the sections *Limnorchis* and *Piperia* in the western United States and Canada. The most confusing problem in the eastern United States and Canada involves the much misunderstood *H. flava* (L.) R. Br. This is due not only to the variability of the species itself, and to the inclination of some authors to segregate entities based on minor variations, but also to the fact that some forms of *H. flava* are superficially similar to some forms of *H. viridis* (L.) R. Br. var. *bracteata* (Muhl.) Gray. This superficial resemblance is especially true of herbarium specimens.

Although Ames, in 1910, recognized the existence of two forms of *H. flava*, he included them under one concept. He wrote (Orchidaceae, fasc. 4, p. 44): "*Habenaria flava* is represented by two forms, one of which is common in the northern United States. That these forms are specifically or even varietally distinct from one another is very doubtful. The specimens in the Linnaean and Gronovian herbaria [*Orchis flava*] are comparable to the specimens with elongated racemes frequently found in

the South and Southwest. The specimen in Lindley's herbarium at Kew which represents *Platanthera herbiola* Lindl. is comparable to the form with congested racemes not uncommon in the New England states . . . ”

It now seems best to recognize two variants in this species, based not only on distribution and the difference in habit but also on floral differences. The typical form, *H. flava*, is primarily southern in distribution. The more northern variant, based on *Platanthera herbiola*, has in the past been recognized by some authors as *Habenaria flava* var. *virescens* (Muhl. ex Willd.) Fernald. However, as pointed out below, *Orchis virescens* Muhl. ex Willd., upon which the above combination is based, is doubtless referable to *H. viridis* var. *bracteata*.

***Habenaria flava* (L.) R. Brown** in Sprengel Syst. Veg. 3 (1826) 691.

Orchis flava Linnaeus Sp. Pl. (1753) 942.

Orchis bidentata Elliott Sketch Bot. S.C. and Ga. 2 (1824) 488.

Orchis scutellata Nuttall in Trans. Am. Phil. Soc. n.s. 5 (1834) 161.

Platanthera flava Lindley Gen. & Sp. Orch. Pl. (1835) 293.

Platanthera fuscescens Kränzlin Orch. Gen. & Sp. 1 (1899) 637, 943, in part as to Am. syn.

Perularia bidentata Small Fl. Southeastern U. S. ed. 2 (1913) 314.

Perularia scutellata Small Fl. Southeastern U.S. ed. 2 (1913) 314.

Perularia flava Schlechter in Fedde Repert. 16 (1919) 286, as to name only.

The type of *Orchis flava*, from Virginia, in the Linnaean Herbarium (examined by Ames) is a plant, the lower part of which is missing, with a solitary leaf and a

subscapose raceme of scattered flowers. The lowermost bracts of the raceme slightly exceed the flowers, but the uppermost bracts are about equal to or shorter than the flowers. An examination of a specimen in the Ames Herbarium from Early Co., Georgia (*R. M. Harper* 1909), which was compared by Ames with the type of *Orchis flava* and with the specimen in the Gronovian Herbarium, reveals that it is also the characteristic plant found in the southern and southwestern United States. The lip of the flowers in this collection is scarcely or only shallowly toothed at the base. A specimen of this collection in the New York Botanical Garden Herbarium is determined as *Perularia scutellata* (Nutt.) Small.

In 1824, Elliott described *Orchis bidentata* from the "... middle districts of Georgia and Carolina." His description of this segregate agrees closely with typical *H. flava*, and an examination of the scapose inflorescence of Elliott's putative type in the Charleston Museum shows that it is similar to the Linnaean plant.

In 1834, Nuttall described *Orchis scutellata* from Arkansas. His description of the plant is, in part, as follows: "... Stem angular, about a foot high, bearing two distant, unequal, lanceolate, acute leaves, and two or three bracts below the commencement of the spike; floral bracts acute and sheathing, each about the length of the germ [ovary]; flowers remote, forming a scattered spike three to four inches long; ... [petals] a little crenulated along the margin in common with the lip, ... the lip somewhat longer than the lateral segments, partly oblong-oval, emarginate at the extremity, and at its commencement producing a denture on either side, and one protuberant or central elevation."

Small, in 1913 (*Fl. Southeastern U.S.* ed. 2, p. 314), maintained *Perularia bidentata* (*Orchis bidentata*) and *P. scutellata* (*Orchis scutellata*) as distinct from *P. flava*. He

separated these two concepts from *P. flava* on the basis that the lip was about as wide as long, instead of being longer than wide, and the floral bracts were mostly shorter than the flowers. These two characters attributed to *P. bidentata* and *P. scutellata* are referable to typical *H. flava*. In separating *P. scutellata* from *P. bidentata*, Small intimates in his key and description that *P. scutellata* lacks basal lateral teeth. He says of *P. scutellata*: "... bracts shorter than the flowers: ... lip suborbicular or broadly oval in outline, ..." Nuttall clearly stated that the lip of his plant produced a "denture" on each side at the base.

The flowers in a collection from McCreary Co., Kentucky (*F. T. McFarland & H. J. Rogers 99*) were found to have a lip which is essentially entire. Another collection from Shannon Co., Missouri (*E. J. Palmer 34828*) was found to have flowers with rather large rhombic-ovate petals and a prominent lobule, instead of a tooth, on each side of the lip; the lobules being somewhat crenate and the tubercle on the face of the lip extremely elongated and conspicuous. These two specimens represent extreme conditions of *H. flava*.

Habenaria flava may be briefly described as follows: Plant 1.5–6 dm. tall; stem slender, with two or occasionally three leaves below, long-bracted above, provided on the lower part with one or more tubular sheaths; leaves usually two, distant, oblong-elliptic to narrowly lanceolate, subobtuse to acuminate and attenuate, sheathing the stem, 7–20 cm. long, 1.2–5 cm. wide; raceme subscapose, usually short-bracted, laxly flowered, cylindrical, 6–20 cm. long, 1.2–2 cm. in diameter; floral bracts narrowly lanceolate, acuminate, usually equalling or shorter than the flowers; sepals ovate-oblong to rhombic-ovate or suborbicular, subobtuse to rounded at the more or less crenulate apex, 2–5.5 mm. long, 1.5–2.5 mm. wide;

petals obliquely oblong to orbicular, rounded to obtuse at the more or less crenulate apex, 2–5 mm. long, 1.5–4 mm. wide; lip ovate to suborbicular or suborbicular-quadrate, rarely oblong, with or sometimes without a tooth on each side at the base, occasionally with the lateral teeth prominent, more or less crenulate on the margins, provided with a tubercle on the median face below the middle, 2.2–6 mm. long, 2–5 mm. wide across the basal teeth or lobules, usually almost as wide as long; spur cylindrical and slender or slender-clavellate, 4–9 mm. long; capsule obliquely ellipsoid, about 8 mm. long.

Habenaria flava is commonly found in open woods in floodplain areas of streams and in wet soil of thickets, meadows and swales. It is also found in sphagnum bogs, swamps and in gravelly soil on the margin of lakes and streams.

This species is primarily a plant of the Atlantic Coastal Plain and Gulf Coast. It is now known to occur from central Florida along the coast to Maryland, with a disjunct area in Nova Scotia, along the Gulf Coast and Piedmont Plateau to Texas, on the Cumberland Plateau in Tennessee and Kentucky, and in the Mississippi drainage basin in Arkansas, Tennessee, Missouri, Illinois and Indiana.

***Habenaria flava* (L.) R. Brown var. *herbiola* (R. Br.) Ames & Correll comb. nov.**

Habenaria herbiola R. Brown in Aiton Hort. Kew. ed. 2, 5 (1813) 193.

Orchis fuscescens Willdenow *sensu* Pursh Fl. Am. Septentr. 2 (1814) 587, not Linnaeus, not Gmelin.

Orchis herbiola Pursh Fl. Am. Septentr. 2 (1814) 743.

Habenaria fuscescens Torrey Comp. Fl. Northern and Middle States (1826) 318.

Orchis glareosa Rafinesque in Atlant. Journ. 1 (1832) 150.

Orchis fuscata Rafinesque in Atlant. Journ. 1 (1832) 150.

Platanthera herbiola Lindley Gen. & Sp. Orch. Pl. (1835) 287.

Tulotis fuscescens Rafinesque Fl. Tellur. 2 (1836) 37.

Tulotis herbiola Rafinesque Fl. Tellur. 2 (1836) 37.

Perularia virescens A. Gray in Bot. Gaz. 5 (1880) 63, as to plant, not as to name.

Platanthera fuscescens Kränzlin Orch. Gen. & Sp. 1 (1899) 637, 943, in part as to Am. syn.

Perularia flava Farwell in Eleventh Ann. Rept. Commissioners Parks and Boulevards Detroit (1900) 54—Rydberg in Britton Man. Fl. Northern States and Canada (1901) 292—Small Fl. Southeastern U.S. ed. 2 (1913) 314.

Habenaria flava var. *virescens* Fernald in Rhodora 23 (1921) 148, in footnote, as to plant, not as to name.

In 1813, Robert Brown described *Habenaria herbiola* from "... North America." His description of the plant is as follows: "H. cornu filiforme germine brevior, labello oblongo obtuso basi utrinque dentato; palato undentato, bracteis flore longioribus."

Later, in 1835, Lindley, in making the combination *Platanthera herbiola*, wrote: "*O. scutellata* of Nuttall seems to differ in nothing except its lip being emarginate." An examination of a specimen in the Ames Herbarium from Plymouth Co., Massachusetts (*C. Blomberg*) which was compared by Ames with *Platanthera herbiola* at Kew and with specimens in the Nuttall Herbarium labelled *Orchis herbiola*, reveals that it is the northern form with short-pedunculate stem and congested raceme with elongated floral bracts exceeding the flowers.

Small, in 1913, treated this northern form of the species as *Perularia flava*. He wrote: "... bracts mostly longer than the flowers; ... lip hastate, the middle lobe

oblong to lanceolate, . . . In swamps and marshes, Ontario to Minnesota and Louisiana." Later, in 1933 (Man. Southeastern Fl., p. 371), despite the fact that *Orchis flava* was originally described from Virginia, Small gave its distribution as ". . . various provinces rarely E of Blue Ridge, La. to Minn., Ont., and N. S."

It is of interest to note that a specimen in the Ames Herbarium from Franklin Co., Vermont (*E. Brainerd*) has flowers whose lip is narrowly linear-oblong and entire or with only an incipient tooth on one or both sides at the base.

Variety *herbiola* is distinguished from the typical form of the species in that the plant is more robust and the usually broader leaves, which may be as many as five, extend further up the stem. The raceme is also more compact with the longer floral bracts often much exceeding the flowers. The characteristically oblong-quadrate, instead of ovate to suborbicular, lip of var. *herbiola* which is longer than wide is a distinctive feature by which to separate these two entities.

Variety *herbiola* is found in the same type of habitat as the typical form. However, it is sometimes found in dry sterile soil and dry sedge marshes. It is now known to occur from Nova Scotia, New Brunswick, Quebec and Ontario through New England, New York and Pennsylvania to Maryland, south along the Allegheny Mountains through West Virginia and Virginia to North Carolina and Tennessee, westward through Ohio, Indiana, Illinois and Wisconsin to Minnesota and Missouri.

***Habenaria viridis* (L.) R. Brown var. *bracteata* (Muhl.) A. Gray** Man. Bot. Northern U.S. ed. 5 (1867) 500.

Orchis bracteata Muhlenburg in Willdenow Sp. Pl. 4 (1805) 34.

- Orchis virescens* Muhlenburg in Willdenow Sp. Pl. 4 (1805) 37.
- Orchis bractealis* Salisbury Parad. Lond. (1805) t. 110.
- Satyrium bracteatum* Persoon Syn. Pl. 2 (1807) 507, non Lindl.
- Satyrium virescens* Persoon Syn. Pl. 2 (1807) 507.
- Satyrium bracteale* Salisbury in Trans. Hort. Soc. 1 (1812) 290.
- Habenaria bracteata* R. Brown in Aiton Hort. Kew. ed. 2, 5 (1813) 192.
- Orchis viridis* Willdenow *sensu* Pursh Fl. Am. Septentr. 2 (1814) 587, excl. syn. in part.
- Orchis flava* var. *virescens* Green in Trans. Soc. Prom. Useful Arts 3 (1814) 120 (Cat. Pl. Indig. N. Y. (1814) 60).
- Habenaria virescens* Sprengel Syst. Veg. 3 (1826) 688.
- Gymnadenia viridis* Sprengel Syst. Veg. 3 (1826) 693, in part.
- Habenaria viridis* R. Br. *sensu* Chamisso in Linnaea 3 (1828) 31, as to distribution, not as to name.
- Gymnadenia bracteata* Presl Rel. Haenk. (1830) 92.
- Orchis viridis* β *Vaillantii* Tenore Syll. Add. (1831) 629.
- Peristylus bracteatus* Lindley Gen. & Sp. Orch. Pl. (1835) 298.
- Peristylus virescens* Lindley Gen. & Sp. Orch. Pl. (1835) 298.
- Platanthera bracteata* Torrey Fl. N. Y. 2 (1843) 279.
- Platanthera viridis* var. *bracteata* Reichenbach filius Orch. Europ. (1851) 130, t. 83 (435).
- Coeloglossum Vaillantii* Gussoni in Reichenbach filius Orch. Europ. (1851) 130.
- Coeloglossum bracteatum* Parlatore Fl. Ital. 3 (1860) 409, in text.
- Peristylus bracteatus* f. *major* Franchet & Savatier Enum. Pl. Jap. 2 (1877) 31 (1879) 513.

Perularia virescens A. Gray in Bot. Gaz. 5 (1880) 63, as to name, not as to plant.

Coeloglossum viride b) *bracteatum* Richter Pl. Europ. 1 (1890) 278.

Peristylus viridis var. *bracteata* Reichenbach filius ex Kurtz in Engl. Bot. Jahrb. 19 (1894) 408.

Platanthera Chorisiana Kränzlin Orch. Gen. & Sp. 1 (1899) 1, as to characters of the labellum and fig. in Reichenbach filius Orch. Europ.

Platanthera viridis Lindley *sensu* Finet in Bull. Soc. Bot. Fr. 47 (1900) 284, in part.

Habenaria flava var. *virescens* Fernald in Rhodora 23 (1921) 148, in footnote, as to name, not as to plant.

In 1805, Muhlenburg described *Orchis virescens* from Pennsylvania. He wrote: "O. labello lanceolato crenato, petalis conniventibus, cornu [spur] obtuso scrotiformi, bracteis flore longioribus . . . Flores *virescentes* . . . Labellum *lanceolatum crenatum*. Cornu *obtusum scrotiforme brevissimum*."

Later, in 1826, Sprengel, in making the combination *Habenaria virescens*, said that the spur was obtuse and didymous. Still later, in 1835, in making the combination *Peristylus virescens*, Lindley wrote: "Unknown to North American botanists. Is it some state of *Peristylus viridis*, or *bracteata*?"

It is strange that Lindley's question did not provoke later botanists to investigate more thoroughly the plant or description of the concept in question. It is clear to us that the plant originally described as *Orchis virescens* is referable to *H. viridis* var. *bracteata* instead of *H. flava* to which species it has formerly been referred. The combination of characters attributed to *O. virescens*—lanceolate (often used for oblanceolate during Muhlenburg's time) lip which may be interpreted as being "crenato" at the apex; connivent petals and sepals; short, obtuse,

scrotiform spur; and long bracts exceeding the flowers—could be referable only to *H. viridis* var. *bracteata*. Muhlenburg does not mention the lip as having a tubercle on its face, a character of *H. flava*. The spur of *H. flava* and its var. *herbiola* is never scrotiform, but is cylindrical and slender-elongated or somewhat clavellate.

Specimens in the Muhlenburg Herbarium in the Academy of Natural Sciences of Philadelphia afford little satisfaction toward solving this problem. According to Dr. F. W. Pennell, the folder marked *Orchis virescens* is in the handwriting of Dr. R. E. Griffith, Curator of the collections of the American Philosophical Society about 1830. Included in this folder are specimens of *Habenaria integra* (Nutt.) Spreng. and *H. flava* var. *herbiola*. These are doubtless the plants which were merely interpreted by Griffith to be *Orchis virescens* and, consequently, should not be considered as authentic.

II. DICHAEA ECHINOCARPA AND ITS ALLIES

The genus *Dichaea* is a very natural assemblage of species. However, because of the close affinity of the species, several of them are extremely difficult to define. In such a genus where various species are almost identical vegetatively, it is essential to make a floral dissection before an accurate determination is possible. It is also to be expected that natural hybrids will occur because often several species may grow matted and entwined on the same tree or rock, thus affording easy cross-pollination. This creation of a hybrid population adds to the perplexity of identifying some of the species or so-called species. Another disturbing fact is that numerous sterile specimens have been collected which are, for the most part, indeterminable and thus the material with which to work is limited.

The species of *Dichaea* treated here belong to the sec-

tion *Eudichaea*, characterized by having persistent leaves which are continuous with the leaf-sheaths.

***Dichaea echinocarpa* (Sw.) Lindley** Gen. & Sp. Orch. Pl. (1833) 208, exclude synonymy in part.

Epidendrum echinocarpon Swartz Prodr. Veg. Ind. Occ. (1788) 124, exclude synonymy.

Cymbidium echinocarpon Swartz in Nov. Act. Ups. 6 (1799) 71, exclude synonymy in part.

Pachyphyllum echinocarpon Sprengel Syst. Veg. 3 (1826) 731.

We consider the interpretation of this species by Fawcett and Rendle (Flora of Jamaica 1 (1910) 136, t. 30, figs. 26–30) to be correct. The lip (fig. 1) is essentially entire with only a slight dilation on each side above the middle or near the apex. The leaves (fig. 3) of *D. echinocarpa* are as a rule sufficiently different from those of *D. muricata* (fig. 4) to facilitate the separation of these often confused species. The thin-herbaceous, elliptic-lanceolate leaves of *D. echinocarpa* taper to a long-apiculate to acuminate apex, whereas the leaves of *D. muricata* are thick-subcoriaceous, ovate-elliptic to oblong-elliptic and rounded and apiculate at the apex.

Since it was originally described, this species has been confused with the invalid *Limodorum pendulum* Aubl. This confusion resulted from the citation by Swartz of *Limodorum pendulum* as a synonym of his *Epidendrum echinocarpon*. Lindley perpetuated this error by citing *Limodorum pendulum* as a synonym when he made the combination, *Dichaea echinocarpa*. The invalidity of *Limodorum pendulum* is discussed later.

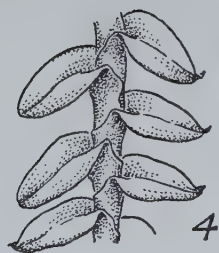
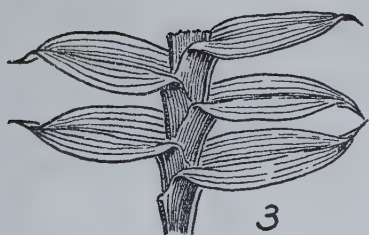
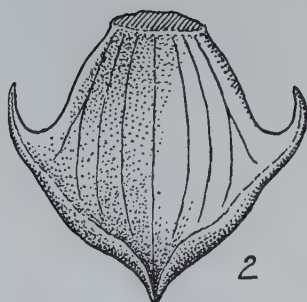
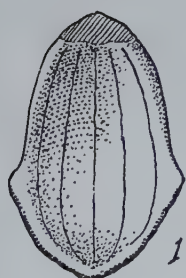
This species is rare in Costa Rica; it is widespread but not common throughout the West Indies. It is found on trees and shaded rocks in forest, and grows up to 2400 meters altitude in Costa Rica.

EXPLANATION OF THE ILLUSTRATION

PLATE IV. 1, *DICHAEA ECHINOCARPA* (Sw.) Lindl., lip, front view, five times natural size. 2, *D. ECHINOCARPA* var. *LOBATA* Ames & Correll, lip, front view, five times natural size. 3, *D. ECHINOCARPA*, section of stem showing leaves, natural size. 4, *D. MURICATA* (Sw.) Lindl., section of stem showing leaves, natural size.

Drawn by G.W. DILLON

PLATE IV





COSTA RICA: La Palma, *A.M. Brenes* 483 (Herb. Ames); [San Mateo], *A.M. Brenes* 482 (Herb. Ames).

JAMAICA: Blue Mt., Marce's Gap, *M. A. Chrysler* (Herb. Ames); Marce's Gap, *G. E. Nichols* 45 (Herb. Gray); Portland Gap and vicinity, *W. R. Maxon* 9798 (Herb. Ames); Marce's Gap to Vinegar Hill, vicinity of Cinchona, *N. L. Britton* 213 (Herb. Ames); east of Cuna Cuna Gap, St. Thomas, *W. R. Maxon* 9433 (Herb. Ames).

PUERTO RICO: Vicinity of Ala de la Piedra above Villalba, *N. L. Britton & F. S. Earle* 6103 (Herb. Ames).

HAITI: Massif de la Telle, Morne Brouet, on the slope towards Rivière Corail, *E. L. Ekman* 1348 (Herb. Ames).

SANTO DOMINGO: Barahona, *Pater Fuertes* 680 (Herb. Ames).

CUBA: "Cuba Orientali," *C. Wright* 646, 1702 (Herb. Gray) (both specimens labelled *Dichaea muricata* Lindl., cited as *D. pendula* by Cogniaux in Urban Symb. Antill. 6 (1910) 670 and by Kränzlin in Engler Pflanzenreich IV. 50 (Heft 83) (1923) 38.

***Dichaea echinocarpa* (Sw.) Lindley var. *lobata* Ames & Correll var. nov.**

Herba species formae typicae est similis praeterquam quod labellum lobos laterales distinctos graciles habet.

Variety *lobata* is vegetatively identical with the typical form of the species. However, the lip (fig. 2), instead of being essentially entire as in the typical form (fig. 1), has the lateral dilations produced into distinct, slender, more or less recurved lobes. The lip approaches in form that of *D. muricata*. However, var. *lobata* is readily separated from that species by its thin-herbaceous, elliptic-lanceolate leaves which taper to a long-apiculate to acuminate apex. The leaves of var. *lobata* are up to 2.5 cm. long and 1 cm. wide below the middle.

COSTA RICA: San José, La Palma, altitude about 1600 meters, on mossy tree trunk, *P. C. Standley* 33120 (TYPE in Herb. Ames No. 30208, in part); San José, La Palma, altitude about 1600 meters, on mossy tree trunk, flowers dull yellow, lip pinkish white, *P. C. Standley* 33150 (Herb. Ames); Cartago, El Muñeco, on the Río Navarro, altitude 1400-1500 meters, on tree, *P. C. Standley & J. Valerio* 51703 (Herb. Ames).

× **Dichaea intermedia** Ames & Correll *hybr. nov.*
(*D. squarrosa* Lindley × *D. trichocarpa* (Sw.) Lindley)

Folia linearia vel lineari-lanceolata, obtusa et apiculata usque ad acuminata vel angustata et longe apiculata. Sepala ovato-elliptica vel elliptico-lanceolata, obtusa vel subacuminata. Petala oblongo-elliptica vel elliptico-ob lanceolata, acuta vel apiculata. Labellum carnosum, in circuitu late oblongo-quadratum, concavum, lobulo parvo angulari prope apicem utrinque instructum. Columna brevis, carnosae, ligula parva erecta subglabra vel ciliata antice ornata.

This natural hybrid is vegetatively similar to *D. trichocarpa*. However, florally, it is more or less intermediate between the above-mentioned species and *D. squarrosa*. Its fleshy-thickened leaves, which are 7–17 mm. long and 2–3 mm. wide, are typically linear to linear-lanceolate and acuminate or tapering and long-apiculate as in *D. trichocarpa*. They are, however, sometimes obtuse and apiculate as in *D. squarrosa*. The lip and column (fig. 2a) are distinctly intermediate between those of the putative parents. The lip, which is 6–7 mm. long and 3–4 mm. wide across the middle, is fleshy and concave, broadly oblong-quadrate in outline (fig. 2b), with a small angular lobule on each side near the apex. The broad, concave basal half of the lip resembles the condition found in *D. trichocarpa*, whereas the somewhat spreading, not strongly conduplicate, apical half resembles the typical lip of *D. squarrosa*. The column (fig. 2a) is short and fleshy, being 3–4 mm. long, and is provided with a small, erect, nearly glabrous to ciliate ligule on the ventral surface. The sepals, which are 8–10 mm. long and 3.2–5 mm. wide, are ovate-elliptic to elliptic-lanceolate and obtuse to subacuminate. The petals, which are 7–9 mm. long and 2.5–4 mm. wide, are oblong-elliptic to elliptic-ob lanceolate and acute to apiculate. The flowers are described

by collectors as "white and bluish, very fragrant," "white with purplish infusion," and "lip bluish purple and white."

It is seldom that such a distinctive natural hybrid is found in the Orchidaceae. \times *Dichaea intermedia* has been found only in Mexico and Guatemala where it is epiphytic on trees in humid forests up to 1500 meters altitude.

MEXICO: Vera Cruz, Santa Ana, *C. A. Purpus 443* (Herb. Gray); Vera Cruz, Orizaba, *Botteri 524, 892* (Herb. Gray); Vera Cruz, Tlapacayan, *M. B. Foster 12, 13* (Herb. Ames); Oaxaca, near Copalita, region Pluma Hidalgo, *O. Nagel 5295* (atypical) (Herb. Ames); Chiapas, near settlement "La Silva," *O. Nagel 5615* (Herb. Ames).

GUATEMALA: Alta Verapaz, Cobán, *H. von Tuerckheim II 1798* (TYPE in Herb. Gray); Alta Verapaz, Pansamalá, *H. von Tuerckheim 1247* (Herb. Gray); Alta Verapaz, Cobán, *W. C. Muenschner 12531* (Herb. Field Mus.); Alta Verapaz, Samac, *H. Johnson 297* (Herb. Ames).

***Dichaea trichocarpa* (Sw.) Lindley Gen. & Sp. Orch. Pl. (1833) 209.**

Epidendrum trichocarpon Swartz Prodr. Veg. Ind. Occ. (1788) 124.

Cymbidium trichocarpon Swartz in Nov. Act. Ups. 6 (1799) 71.

The reflexed, twisted leaves (fig. 1c) of *D. trichocarpa* are typically linear-lanceolate and tapering to the long-apiculate to subacuminate apex. The suborbicular floral bracts (fig. 1d) are shortly acuminate and usually strongly recurved at the apex. The concave-cymbiform lip is subquadrate in outline (fig. 1b) with the lateral lobes small or obsolescent. The eligulate column (fig. 1a) is 2.5–3 mm. long, and the linear-oblong to elliptic or elliptic-oblancheolate petals are obtuse and apiculate to acute at the apex. The fragrant flowers are described by collectors as white with the lip barred and suffused with bluish purple.

This species is rare in Mexico, Guatemala and Costa Rica, but is widespread and rather common in the West

EXPLANATION OF THE ILLUSTRATION

PLATE V. 1a-1d. *DICHAEA TRICHOCARPA* (Sw.) Lindl.

1a, lip and column, side view, five times natural size.

1b, lip spread out, front view, five times natural size.

1c, section of stem showing leaves, twice natural size.

1d, floral bract and bractlet, five times natural size.

2a-2b. × *DICHAEA INTERMEDIA* Ames & Correll.

2a, lip and column, side view, five times natural size.

2b, lip, spread out, front view, five times natural size.

3a-3d. *DICHAEA SQUARROSA* Lindl.

3a, lip and column, side view, five times natural size.

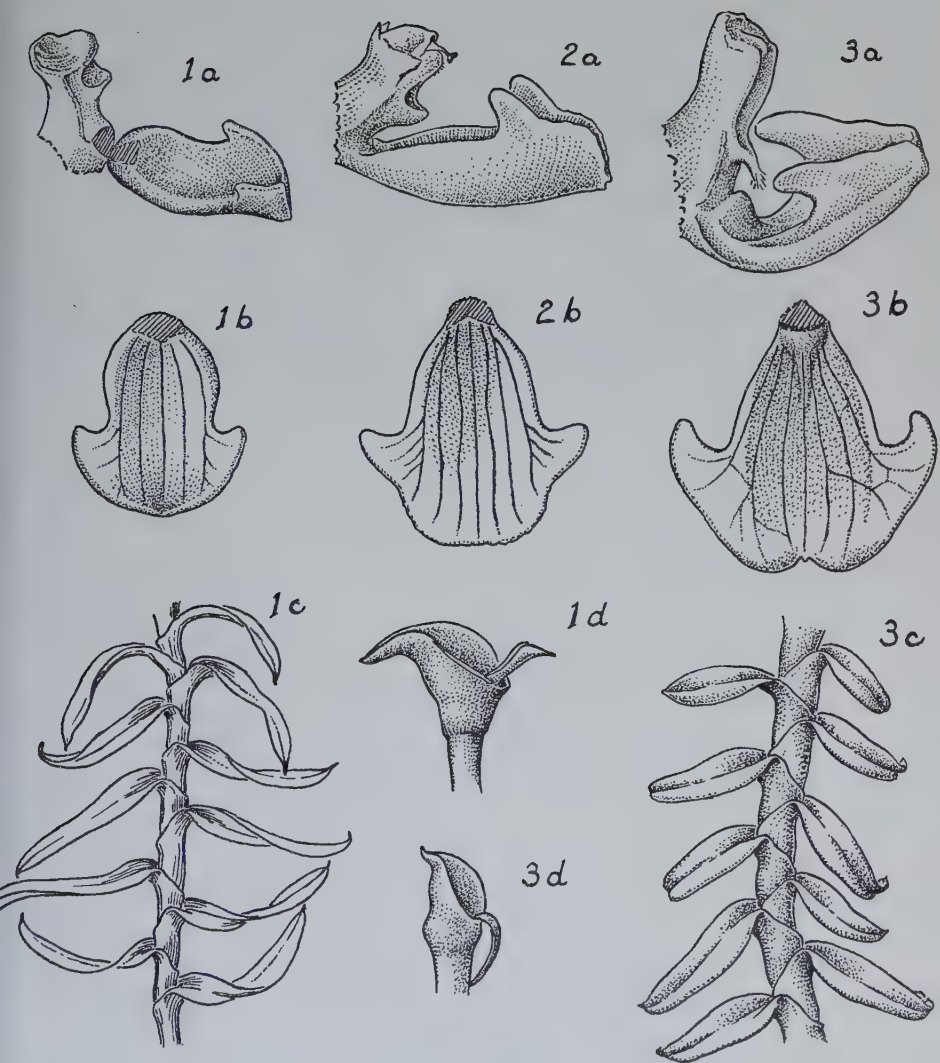
3b, lip, spread out, front view, five times natural size.

3c, section of stem showing leaves, twice natural size.

3d, floral bract and bractlet, five times natural size.

Drawn by G.W. DILLON

PLATE V



Indies. It is found on trees and rocks in humid forests and on brushy banks usually at high elevations, up to 1850 meters altitude.

MEXICO: Chiapas, Lake of Tzisceao and Montebello, east of Comitán, *O. Nagel 5536* (Herb. Ames).

GUATEMALA: Alta Verapaz, Cobán, *H. von Tuerckheim 2450* (Herb. Ames); Alta Verapaz, near Tactic, above the bridge across Río Frío, *P. C. Standley 90473* (Herb. Ames, Herb. Field Mus.).

COSTA RICA: Cartago, Carpintera, *C. H. Lankester 471* (Herb. Ames); Cartago, Cerro de la Carpintera, *P. C. Standley 34366* (Herb. Ames); Las Concavas, *C. H. Lankester 1006* (Herb. Ames); Tapanti, *M. Valerio 2622* (Herb. Ames); Cartago, Carpintera, *H. E. Stork 2244*, in part (Herb. Ames).

CUBA: Oriente, La Guineu, *C. Wright 1701* (Herb. Gray); Oriente, Sierra Maestra, Pico Turquino, *E. L. Ekman 5281* (Herb. Gray); Oriente, High Maestra, *Bro. Léon 10888* (Herb. Ames); Oriente, Maestra ridge, *Bro. Léon 10717* (Herb. Ames); Santa Clara, Glen Ames, Mt. Harvard, Buenos Aires, Trinidad Hills, *J. G. Jack 8081* (Herb. Gray).

JAMAICA: [Mabeis] River, *G. E. Nichols* (Herb. Gray); southwestern slopes of Mosman's Peak, along trail to "Main Ridge Gap," *W. R. Maxon 10101* (Herb. Ames); Tweedside, vicinity of Moody's Gap, *N. L. Britton 3405* (Herb. Ames); Abbey Green and vicinity, *W. R. Maxon 10054* (Herb. Ames).

HAITI: Vicinity of Furcy, *E. C. Leonard 4668* (Herb. Ames); Massif de la Telle, Nouvelle Touraine, Chapelle Faure, towards Morne La Visite, *E. L. Ekman 1481* (Herb. Ames).

SANTO DOMINGO: Barahona, Polo, *W. L. Abbott 1860* (Herb. Ames, Herb. Gray); Constanza, *H. von Tuerckheim 3524* (Herb. Ames); Barahona, *P. Fuertes 876, 950B* (Herb. Ames); de la Vega, *M. Fuertes 1828* (Herb. Ames).

***Dichaea squarrosa* Lindley** in Ann. & Mag. Nat. Hist. ser. 1, 4 (1840) 384.

Dichaea suaveolens Kränzlin in Engler Pflanzenr. IV. 50 (Heft 83) (1923) 39.

This species has in the past been included under *D. trichocarpa* (Sw.) Lindl., due in part to the existence of a natural hybrid, $\times D. intermedia$ Ames & Correll, be-

tween *D. squarrosa* and *D. trichocarpa*. As shown by a photograph in the Ames Herbarium of Hartweg's specimen in the Lindley Herbarium, *D. squarrosa* is vegetatively characterized by its short, linear, obtuse and apiculate, strongly reflexed and usually twisted leaves (fig. 3c). The leaves of *D. trichocarpa* (fig. 1c) and $\times D. intermedia$ are typically tapering to the long-apiculate to subacuminate apex. The suborbicular floral bracts of *D. squarrosa* (fig. 3d) are only shortly apiculate instead of being shortly acuminate and strongly recurved as in *D. trichocarpa* and in most specimens of $\times D. intermedia$. Florally, *D. squarrosa* has a longer column (4 mm. or more long) (fig. 3a) which is provided with a prominent pendent or projecting, hairy, ventrally placed ligule, whereas the column of *D. trichocarpa* (fig. 1a) and $\times D. intermedia$ (fig. 2a) is 4 mm. or less long and is eligulate or has only a small erect glabrous or nearly glabrous ligule. The petals of *D. squarrosa* are cuneate and more or less truncate at the apex and the fleshy lip (fig. 3b) is cuneate-flabellate in outline, whereas the petals of *D. trichocarpa* and $\times D. intermedia$ are obtuse and apiculate to acute, and the lower half of the lip is typically broadly rounded and concave.

Dichaea squarrosa, *D. trichocarpa* and $\times D. intermedia$ comprise a closely allied group of plants. These concepts are easily distinguished from *D. muricata* and its variety *neglecta* (Schltr.) Kränzl. (with which they are sometimes confused) by their linear to linear-lanceolate, usually strongly reflexed leaves which are not at all decurrent on the leaf-sheaths. Furthermore the leaf-sheaths do not noticeably clasp the stem as in *D. muricata* and its variety *neglecta*. Instead, the lamina of the leaf is produced at the apex of the leaf-sheaths.

Dichaea squarrosa, on the basis of the specimens we have seen, is confined to Mexico, Guatemala, Salvador

and Costa Rica where it is found on trees in humid forests at high elevations, occasionally up to 2600 meters altitude. On the contrary, *D. trichocarpa* is widespread and rather common in the West Indies, with a few stations in Mexico, Guatemala and Costa Rica. \times *Dichaea intermedia* occurs only in Mexico and Guatemala, the northern limit of the area of distribution for both *D. squarrosa* and *D. trichocarpa*.

Lindley (in Ann. & Mag. Nat. Hist. ser. 3, 1 (1858) 333) reported *D. squarrosa* from Cuba, "Monte Verde; woods; on trees," collected by C. Wright. We have seen no material of this species from the West Indies. It is quite likely that this report was based on an erroneous determination of a specimen of *D. trichocarpa*.

MEXICO: Mexico, near Temascaltepec, G. B. Hinton 2703 (Herb. Ames); Mexico, near San Juan Atzingo, O. Nagel & Juan G. 2699 (Herb. Ames); Mexico, Temascaltepec, La Labor, G. B. Hinton 900 (Herb. Ames); Mexico, Temascaltepec, Rincon, G. B. Hinton 15426 (Herb. Ames); Morelos, near Cuernavaca, C. G. Pringle 7628 (Herb. Ames, Herb. Gray); Morelos, mts. N.W. of Cuernavaca, tow. Buenavista del monte and to Mexicapa, O. Nagel & Juan G. 2701 (Herb. Ames); Morelos, south slope of Volcano Popocatepetl, L. O. Williams 3866 (Herb. Ames); Guerrero, Galeana, Teotepec, G. B. Hinton 14282 (Herb. Ames); Chiapas, Soconusco, Mt. Boguerón, O. Nagel 4326 (Herb. Ames); Chiapas, Mt. Ovando, E. Matuda 1811 (Herb. Ames).

GUATEMALA: Guatemala, Aguarce, F. C. Lehmann 1642 (Photograph seen, type of *D. suaveolens* Kränzl.) (Herb. Ames); Guatemala, near Finca La Aurora, "Cienpies," I. Aguilar 262 (sterile) (Herb. Field Mus.); Guatemala, slopes of Volcán de Pacaya, between San Francisco Sales and the base of the active cone, P. C. Standley 80746, 80758 (both sterile) (Herb. Ames, Herb. Field Mus.); Guatemala, Volcán de Pacaya, above Las Calderas, P. C. Standley 58500 (sterile) (Herb. Ames, Herb. Field Mus.); Guatemala, Volcán de Pacaya, J. R. Johnston & John Porter (comm. M. W. Lewis 200) (Herb. Ames); Jalapa, Potrero Carrillo, 13 miles northeast of Jalapa, J. A. Steyermark 33112 (Herb. Ames, Herb. Field Mus.); Quezaltenango, Montaña Chicharro, on lower south-facing slopes of Volcán Santa Mariá, 2-4 miles south of Santa Mariá de Jesús, J. A. Steyermark 34261 (Herb. Ames, Herb. Field Mus.); San Marcos, above Finca El Porvenir, between "Todos Santos Chiquitos" and "Loma de la Paloma," south-facing slopes of

Volcán Tajumulco, *J.A.Steyermark 37256* (sterile) (Herb. Ames, Herb. Field Mus.); also Volcán Zunil, *A.F.Skutch 943* (Herb. Ames).

SALVADOR: San Vicente, Volcán de San Vicente, *P.C.Standley 21569* (sterile) (Herb. Ames, Herb. Gray).

COSTA RICA: Zarcero, *A. Smith H. 180* (sterile) (Herb. Ames); de Alajuela, vicinity of Fraijanes, *P.C.Standley & Rubén Torres R. 47555, 47608, 47611* (all sterile) (Herb. Ames).

III. THE STATUS OF *DICHAEA PENDULA*

***Dichaea pendula* (Aubl.) Cogniaux** in Urban Symb. Antill. 4 (1903) 182, *nom. conf.*

Limodorum pendulum Aublet Pl. Guian. Franc. (1775) 819, t. 322, *nom. conf.*

The sterile plant illustrated by Aublet is doubtless the same as *D. muricata*. However, the floral analysis is apparently a disproportionate drawing of the flower of a *Bletia*, the lip being only about one-third the size of the other floral segments. So far as we know, such a discrepancy in the size of the lip in respect to the other floral segments is not found in either *Dichaea* or *Bletia*. All of the floral segments of these genera are usually nearly equal in length. The slender-clavate, arcuate column illustrated by Aublet resembles that of a *Bletia*.

If it were possible to place *Limodorum pendulum* accurately it would doubtless be found to be conspecific, as to vegetative characters, with *D. muricata* (Sw.) Lindl. instead of being closely allied with the West Indian *D. echinocarpa*, to which it is usually referred. However, the confused plate and accompanying incongruous description of *Limodorum pendulum* necessitate its relegation to the status of *nomen confusum*.

The illustrations of *Dichaea pendula* by Cogniaux (in Martius Fl. Bras. 3, pt. 6 (1906) 486, t. 102, fig. 1) and by Schlechter and Hoehne (in An. das Mem. do Instituto de Butantan, Botan. 1, fasc. 2, 47, T. 11) are what we consider to be representative specimens of *D. muricata*.